

MEASURING PSYCHOLOGICAL RESILIENCE IN COLLEGE STUDENTS: A REVISED SCALE

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Abstract: This paper proposes a revised psychological resilience scale for college students. The scale is based on the revised Connor-Davidson Resilience Scale (CD-RISC), which is a well-validated scale for measuring resilience in adults. The revised scale was developed through a series of studies involving college students in China. The results showed that the revised scale has good reliability and validity. The scale can be used to measure the psychological resilience of college students in China.

Keywords: Psychological resilience, College students, Revised psychological resilience scale, Connor-Davidson Resilience Scale (CD-RISC), Reliability, Validity

1. Introduction

With the transformation of higher education from "elitism" to "popularization", the group of college students not only benefits from the improvement of personal knowledge and abilities brought about by the development of higher education, but also faces various pressures, such as academic pressure, economic pressure, employment pressure, interpersonal pressure, and so on[1]. Improving the ability of college students to cope with and adapt to stress is of great significance. According to the research of domestic and foreign scholars, psychological resilience is a kind of self-recovery ability of individuals after experiencing major bruising events. Psychological resilience can enable individuals to better cope with major bruising events, which is conducive to the healthy development of individuals. Therefore, an accurate measurement of college students' psychological resilience is helpful to provide guidance for college students to adapt to stressful situations[2].

At present, the measurement tools of psychological resilience mainly rely on measurement scales, and most of the domestic relatively recognized psychological resilience scales are based on the reference and translation of foreign measurement scales. At the initial stage of psychological resilience research, most scholars chose people who had experienced major shocks or contusions, such as the RS (The Resilience Scale) scale designed by Wagnild&Young (1993). With the deepening of research, scholars have begun to expand the scope of their research objects, such as the elderly, youth groups, clinical patients, community residents, military personnel, and so on[3]. Domestic scholars often measure the psychological resilience of college students against a certain specialty and group in the university, such as medicine, nurses, sports, teachers, ethnic minority preparatory

students and other college students. Therefore, it is necessary to re compile and revise the psychological resilience Scale for College Students to make it more widely applicable and targeted[4].

1.1 Concept of Psychological Resilience

The study of resilience began in the United States in the 1970s[5], mainly focusing on the variability of children's development outcomes in adverse environments. Anthony (1998), an American psychologist, put forward the concept of psychological resilience, believing that it is a very important psychological resource for individual self-development. Psychological resilience, also known as resilience, resilience and resilience, refers to a dynamic development process in which risk factors and protective factors act simultaneously when individuals face pressure, adversity and other situations.

(Hu Yueqin and Gan Yiqun, 2008) has been a hot topic in positive psychology research in recent years.

1.2 Measurement Psychological Resilience

Foreign countries first began to pay attention to the influence of mental toughness on the formation and development of individual good personality[6]. In order to explore the characteristics of mental toughness of individuals at different stages of development and different social classes, domestic and foreign scholars have compiled scales with different structures for different groups. Some of them are representative in the table 1 below. □

Table 1: List of representative psychological resilience scales at home and abroad

Time	Editor	Scale name	Measurement Object	Dimension	Number of questions
1989	Bartone	Trait Self psychological resilience Scale	Disaster Family Workers	Execution, Control, Challenge	45
1993	Wagnild&Young	Psychological Resilience Scale(RS)	Elderly people who have experienced major traumatic events	Accept life,Self and personal abilities	25
2003	Friborg	Resilience Scale for a-dults(RSA)	adult	Personal abilities, social skills, family harmony, social support, and personal organization	43
2003	Connor&Davidson	CD-Resilience Scale (CD-RISC)	Ordinary people, clinical patients	Ability, tolerance of negative emotions, acceptance of change, sense of control, and	25

				spiritual beliefs	
2007	Campbell-Sills & Stein	CD-RISC-10	Ordinary population, patients	Ability, tolerance of negative emotions, acceptance of change, control, mental impact	10
2007	Revised by Yu Xiaonan and Zhang Jianxin	CD-RISC	Chinese community population	Resilience, self-improvement, vitality	25
2008	Hu Yueqin, Gan Yiqun	Psychological resilience Scale of adolescent	adolescent	Personal strength, support	27

2. Research Methods

2.1 Research Subjects

Pre survey (EFA) subjects: 176 full-time undergraduate students from a university in Jilin Province were enrolled, and 168 valid questionnaires were collected, with an effective response rate of 95.45%. Among them, 75 males (44.6%) and 93 females (55.4%); The number of freshmen, sophomores, juniors, and seniors is 84 (50%), 26 (15.5%), 46 (27.4%), and 12 (7.1%), respectively. There are 47 students (28%) in science and engineering, 78 students (46.4%) in humanities, 15 students (9%) in arts, and 28 students (16.6%) in other majors.

A formal survey (CFA) was conducted on 1060 full-time undergraduate students from universities in Jilin. 853 valid questionnaires were collected, with an effective response rate of 80.47%. Among them, 352 males (41.3%) and 501 females (58.7%); The number of freshmen, sophomores, juniors, and seniors was 328 (38.5%), 237 (27.8%), 161 (18.9%), and 127 (14.9%), respectively. The number of students majoring in science and engineering, humanities, art, and other majors was 291 (34.1%), 398 (46.7%), 35 (4.1%), and 129 (15.1%), respectively. The source of students is 553 people (64.8%) from rural areas and 300 people (35.2%) from urban areas. There are 344 only children, accounting for 40.3%. From the perspective of professional selection, 384 people (45%) chose independently, 88 people (10.3%) had parents or others' wishes, 334 people (39.2%) had adjustment arrangements, and 47 people (5.5%) had other choices. The overall ranking of the class is 175 students (20.5%) in the top 10%, 327 students (38.3%) in the top 10% -30%, 264 students (30.9%) in the 30% -60%, and 87 students (10.2%) after the 60%.

2.2 Preparation of the Scale

The collection of initial scale questions is mainly obtained through three ways: first, through theoretical analysis, compiling part of the items; The second is the reference to the domestic and foreign representative mental toughness scale items; Thirdly, according to the results of open-ended questionnaires and interviews with teachers and students[7], questions were compiled into the "College Student Mental Toughness Scale" composed of 23 items, which included 2 dimensions (physical strength, social support) and 5 factors (frustration tolerance,

emotional management, positive cognition, family support and interpersonal assistance). The items were positive scoring statement patterns, including 4 items for frustration tolerance, 7 items for emotion management, 5 items for positive cognition, 4 items for family support and 3 items for interpersonal assistance. The initial questionnaire was in the form of Likert-style 5-point scale, from "completely inconsistent" to "completely consistent", which was recorded as 1-5 points.

2.3 Measurement and Statistics of Gauges

In order to preliminarily investigate the structure of the self-made scale and test the quality of each item, a small-scale preliminary trial was conducted in April 2023 on the first draft of the scale that passed expert review. A preliminary measurement table consisting of 23 items was conducted in a university in Jilin region. Before exploratory factor analysis, individual interviews were conducted on some participants to revise unclear, difficult to understand, or ambiguous items. Then, preliminary exploratory factor analysis was conducted on the test results, removing items with low factor load (less than 0.40), low commonality (less than 0.20), significance levels with a decision value (CR) of less than 0.01, and items with a total correlation of less than 0.20. A total of 1 item was deleted. Finally, the psychological resilience scale for college students was formed, which was composed of 22 questions. A formal survey was conducted in universities in Jilin in May 2023. Both pre survey and formal survey adopt the method of questionnaire star network survey, and dispose of invalid questionnaires with short answer time, obvious tendency to answer, or missing answers. SPSS 25.0 was used for data analysis, and AMOS28.0 was used for confirmatory factor analysis.

3. Results and Discussion

3.1 Exploratory Factor Analysis (EFA)

Firstly, determine whether the matrix composed of question scores is suitable for factor analysis. The judgment indicators are KMO coefficient and Barlett sphericity test. According to statistical standards, KMO coefficients exceeding 0.9 are suitable for factor analysis, and factors between 0.8 and 0.9 are more suitable for factor analysis, but Factors below 0.6 are not suitable for factor analysis [8]. When the probability value in the Barlett test is less than 0.01, it can be determined that the matrix is not an identity matrix, and factor analysis can be carried out. In this study, the KMO coefficient was 0.905, and the probability value of Bartlett's sphericity test was 0.000, which is less than 0.01, indicating that the correlation matrix can be used for factor analysis [9]. Using principal component analysis to extract factors, maximum variance orthogonal rotation Perform factor analysis using the conversion method. Determine the number of factors based on the following criteria:

- 1) The characteristic value of the factor is greater than or equal to 1;
- 2) The factors must be consistent with the steep step test of the gravel map;
- 3) The extracted factors can explain at least 1% of the total variation before rotation.

Four factors were preliminarily extracted, with a cumulative variance explanation of 60.264%.

Filter the questions based on the following criteria:

- 1) Delete questions with a maximum factor load less than 0.4;
- 2) The content of the question must belong to the same scope as other questions in the same dimension;
- 3) Each dimension has 3 or more questions.

According to the above standards, gradually delete the questions and conduct factor analysis one by one. Combined with the gravel map, a total of one question (original question 5) was deleted, and four factors were extracted (the two factors of social support in the original scale, namely family support and interpersonal assistance, were combined). The cumulative variance contribution rate was 61.497%, and the KMO was 0.902 (Figure 1 and Table 2).

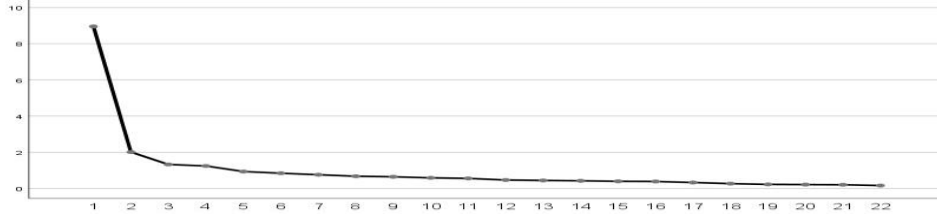


Figure 1: Scree Plot

Table 2: Rotating component matrix

	Fator			
	1	2	3	4
Q1				.677
Q2				.506
Q3				.687
Q6		.549		
Q7		.638		
Q8		.611		
Q9		.631		
Q10		.693		
Q11		.733		
Q12		.586		
Q4			.622	
Q13			.716	
Q14			.735	
Q15			.666	
Q16			.663	
Q17	.579			
Q18	.749			
Q19	.793			
Q20	.743			
Q21	.661			
Q22	.638			
Q23	.770			
Extraction method: Principal Component Analysis				

3.2 Confirmatory Factor Analysis (CFA)

Through the above exploratory factor analysis, it is found that the psychological resilience scale for college students includes four dimensions, namely, frustration tolerance, emotional management, positive cognition, and social support, with a total of 22 questions. But exploratory factor analysis only identifies the model and cannot determine its ideality. In order to further explore whether the dimensional model constructed by the psychological resilience scale for college students is acceptable and whether it matches reality, confirmatory factor analysis is needed. Perform confirmatory factor analysis using AMOS 28.0 statistical software to validate the 4-factor structural model obtained from exploratory factor analysis. The fit index is shown in the table 3 below.

Table 3: Confirmatory factor analysis fit index of the four factor structural model of psychological resilience (N=853)

Fit Index	X ² /df	RMR	RMSEA	GFI	NFI	TLI	CFI	IFI
Result	2.8	0.028	0.078	0.831	0.893	0.892	0.905	0.905

When conducting confirmatory factor analysis, we mainly use these fitting indicators to verify whether the constructed model is acceptable:

- 1) Chi square/df. Generally speaking, if the chi square/df is less than 5, it indicates that the overall model is acceptable, and if the chi square/df is less than 3, it indicates that the model fits well.
- 2) RMR and RMSEA. Its variation range is between 0 and 1. In general, below 0.08 represents a good fit, below 0.05 represents a very good fit, and below 0.01 represents a very good fit.
- 3) The values of indicators such as GFI, NFI, TLI, CFI, and IFI are all between 0 and 1, and the closer their values are to 1, the better the model fits [10]. In terms of these indicators, the model parameter values constructed in this study are relatively ideal, achieving a good fitting level. It also shows that the psychological resilience scale is divided into four dimensions: frustration tolerance, emotional management, positive cognition, and support, forming a four factor model with four first-order factors, which is an ideal fitting model. This validates the results of exploratory factor analysis.

3.3 Reliability and Validity Analysis

3.3.1 Test Reliability

The reliability test of this study used internal consistency reliability. Internal consistency reliability refers to the degree of consistency among all questions in a scale [11]. The scale was measured using Cronbach α Coefficients and Spearman Brown semi correlation coefficients are used to represent the internal consistency reliability. The Cronbach's coefficient of the psychological resilience Scale for College Students is 0.964, and the split half reliability is 0.934. The scale has high reliability, good internal consistency, and a certain degree of stability.

3.3.2 Test Validity

- (1) Content validity

Content validity refers to whether the scale items reflect the psychological traits to be measured [12]. The study adopts an expert scoring method, and the expert group consists of 10 experts, all of whom are university professors

with over 20 years of work experience in management, psychology, and scale construction. The correlation between each item of the scale and the concept of "psychological resilience" was evaluated by using the grading method of 1-4 levels. 1 represents "no correlation", 2 represents "weak correlation", 3 represents "strong correlation", and 4 represents "strong correlation". Calculate the content validity index (CVI) for the total table, each dimension, and each item. Generally, the item level content validity index, overall consistency content validity index, and average content validity index of the scale are required to reach 0.78, 0.80, and 0.90, respectively[13].

The results of this study show that the content validity index (I-CVI) of each item of the psychological resilience scale for college students is 0.83-1.00, the Universal agreement content validity index is (S-CVI/UA) 0.89, with an average Scale-level content validity index (S-CVI/Ave) of 0.981 indicates that experts have recognized these items, ensuring content validity, and conducting interviews with participants during the pre-experiment. College students believe that this scale is easy to understand and there are no unclear or ambiguous items.

(2) Structural validity

Through exploratory factor analysis, it was found that the structure of the scale was in line with previous expectations, ensuring that the scale had good structural validity. In this study, the KMO coefficient is 0.902, and the probability value of the Barrett sphericity test is 0.000, which is less than 0.01, indicating that the correlation matrix can be used for factor analysis[14]. Four factors were extracted using principal component analysis, with a cumulative variance contribution rate of 61.497%. This indicates that each factor has a strong explanatory ability to the question, and the factor load of the retained question is greater than 0.506. The structure of the scale is clear and its validity is good[15].

4. Conclusion

In terms of scale development, this study strives to meet the standards of psychometrics. Based on interviews, open-ended questionnaires, and referring to previous research and representative psychological resilience scales at home and abroad, the initial scale was developed. According to the results of exploratory factor analysis, only one question was deleted, and the next 22 questions were determined. Four factors were explored, named resilience, emotional management, positive cognition, and social support. Four factors accounted for 61.497% of the total variation. The confirmatory factor analysis results show that the explored four factor model has an ideal fitting level. This study conducted reliability and validity tests on the scale. Scaled α The coefficient is 0.964, and the split half reliability coefficient is 0.934. Due to good internal consistency, the reliability is good. In terms of validity, the principle of seeking truth from facts is followed in the process of developing the scale.

Samples are collected from the survey population to collect original questions, and relevant experts are invited to review the questions. The I-CVI is From 0.83 to 1.00, S-CVI/UA is 0.89, with S-CVI/Ave of 0.981, to some extent, ensures the content validity of the scale[16]. The KMO coefficient of the scale is 0.902, the probability value of Bartlett's sphericity test is less than 0.01, and the factor load is greater than 0.506. The scale has a clear structure and good internal structural validity.

From the above measurement indicators, it can be seen that the college students' psychological resilience scale revised in this study not only basically conforms to the previous theoretical concept, but also meets the

requirements of psychometrics. It is a clear, effective and reliable scale, which can be used in the next step of research. However, due to the limited sample size of the survey, it is not possible to cover all types and majors of college students, such as medicine, military and other related majors. Therefore, the validity of the self-made scale in this study still needs to be verified.

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