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Development of a Mental Health Scale for College Students

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ABSTRACT

The purpose of this study is to explore the mental health status of college students in Beijing and develop a scientific assessment scale. First, a systematic review of domestic and international literature related to college students' mental health was conducted, and a three-dimensional model covering adaptation, distress, and resilience was proposed. Then, open-ended questionnaire surveys were carried out based on the literature review to collect data, and a preliminary scale was developed through factor analysis. This study further tested and optimized the preliminary scale to ensure its reliability and validity, so as to form a formal scale. As a result, a formal scale is devised after three testing processes that consist of 134 items. The scale primarily consists of three subscales: adaptation, distress, and resilience. The adaptation subscale covers six points: interpersonal relationships, learning, career choice, emotions, self-adaptation, and satisfaction. The distress subscale includes seven aspects: depression, anxiety, somatization, compulsion, Internet addiction, withdrawal and aggression. The resilience subscale consists of four features: self-confidence, positive cognition, problem-solving, and social support. The results show that all three subscales have good reliability and validity. This scale enables mental health assessment from three distinct levels: adaptation, distress, and resilience, thus objectively reporting the developmental characteristics of college students' mental health. The division of these three levels not only remedies the deficiencies of previous mental health measurements but also meets the practical needs of developmental psychological counseling in universities, clarifying the tasks of mental health education.

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1. Introduction

College students in their late teenage years experience a transition from student life to becoming responsible adults. They face developmental and psychological issues such as separation from their families, adaptation to new environments, and rebuilding interpersonal relationships. A study of 4,799 college students in Spain found that the overall psychological condition of 47.4% of the students exceeded the clinical threshold of psychological well-being, 63.8% of them had subjective well-being distress, and 4.3% had the risk of self-harm or attacking others, indicating that college students' psychological distress was universal[1]. A meta-analysis integrating data from 2010 to 2020 found that the prevalence of sleep problems (23.5%), depression (20.8%), and self-harm (16.2%) among Chinese college students was particularly high. The prevalence of anxiety, depression, sleep problems, and suicide attempts has shown a significant upward trend over the past decade[2].

Through the literature review of previous studies on college students' mental health, it is found that there are some deficiencies, which are mainly manifested in the following three aspects:

1. Mental Health Connotation and Standard Issues

Mental health connotations and standards are the core of research, and different countries, generations and scholars have different views. Although the contending theory promotes the prosperity of theory, the lack of consensus also leads to the suspension of relevant research. This question involves deep content such as outlook on life and values, and it is difficult to have a unified answer, and the theoretical discussion is often disconnected from the practical needs of mental health education in colleges and universities.

2. Problems in the Assessment of Mental Health

In the past, mental health assessment scales were mainly divided into two categories. One was based on overall assessment, covering positive and negative emotions and pathological symptoms; the other was a single positive or negative assessment. The existing problems are: quantitatively, few measurement tools focus on positive mental health (positive), and most of them are evaluated from a pathological perspective (negative), such as depression, anxiety, etc. In terms of applicability, most of the scales are suitable for adults, and few scales have been localized and verified for the development characteristics of college students. Research and application are often disconnected, and most previous research on measurement tools has focused on theoretical discussions, failing to fully consider their applicability and operability in the practice of psychological counselling in colleges and universities.

3. The Orientation of Psychological Counselling at Educational Institutes

Nowadays, psychological counselling in universities is often oriented toward correction, exhibiting three tendencies: the focus on adaptive counselling and resolving psychological crises; the emphasis on correcting psychological disorders while neglecting the management of general psychological issues; and the adult model is practically applied in the analysis and discrimination, ignoring the age characteristics of students. This approach, which "sees the symptoms but not the individual," is difficult to adapt for achieving the goal of modern college education, where it is needed to promote the all-around development of students. Therefore, mental health counselling in colleges and universities urgently needs to shift from focusing on correction to a developmental, preventive and corrective model.

This study aims to address these challenges by creating a new mental health assessment model and developing a more scientific and practical assessment system that can provide a basis for developmental psychological counselling in colleges and universities. Its basic objective is to precisely define the connotation and standards of mental health applicable to college students. Research suggests that college students should have no serious emotional distress, adapt well, show age-appropriate developmental characteristics, and have the potential to self-recover in case of setbacks and failures. Based on this, this study proposes a comprehensive assessment of college students' mental health across three interrelated yet distinct dimensions: adaptation, distress, and resilience. This multidimensional model provides

a more objective and comprehensive overview of the characteristics of mental health and the development of college students. It clarifies the objective of mental health education in universities and addresses the shortcomings of previous single-perspective assessment models. It directly serves the practical needs of developmental psychological counselling in universities.

2. Materials and Methods

2.1. Subject

In a preliminary assessment, a total of 363 college students in Beijing were randomly selected, including 161 boys and 202 girls, aged 19–26 years old, with an average age of 21.77 years (SD = 1.31). 83.5% of the subjects were undergraduates, and two-thirds of the subjects were juniors and seniors.

In the second test, 136 college students (including 39 boys, 96 girls, and 1 unindicated gender) were randomly selected from Beijing, aged 17–30 years, with an average age of 20.62 years (SD = 2.69). 82.26% of the subjects were undergraduates, and more than half of the subjects were freshmen and sophomores.

In the third trial, a stratified random sampling method was used to randomly select 675 college students from colleges and universities in Beijing by grade (freshman to senior, master's and doctoral). Among them, 114 were freshmen, 103 were sophomores, 119 were juniors, 127 were seniors, 159 were master's, and 53 were doctoral students; 326 were male and 349 were female.

2.2. Theoretical Modeling

The study is based on the previous theoretical models and refers to relevant items in similar scales at home and abroad. The main reference is the China College Student Adjustment Scale (CCSAS) and the Symptom Checklist 90 (SCL-90) compiled by Fang and Derogatis, and other tools [3,4].

Combined with the definition of college students' mental health and developmental counseling needs, a topic system containing three major levels of adaptation, distress and resilience was preliminarily formulated: adaptation includes seven aspects: interpersonal adaptation, learning adaptation, campus life adaptation, career choice adaptation, emotional adaptation, self-adaptation and satisfaction; Troubles include depression, anxiety, somatization, compulsion, paranoia, Internet addiction, sexual psychology, dependence, impulsivity, withdrawal, aggression, psychotic tendencies, etc. Resilience includes four aspects: self-confidence, positive cognition, problem-solving, and social support.

2.3. Development of the Formal Scale

This study went through three stages: preliminary test, second test, and third test. The test items were screened and modified based on the data analysis results, and finally a formal questionnaire was formed.

Preliminary Test: The preliminary questionnaire consists of 356 items, including three subscales, with 56 reverse questions. Items are scored on a scale of 1–5 (1 = not at all, 5 = completely compliant). Project analysis and exploratory factor analysis were carried out on the preliminary test data. Based on the analysis results, items with low distinction degree and cross-load in the adaptation, distress, and resilience subscales were excluded. After adjustment, the adaptation subscale was limited from 7 factors to 5 factors, the distress subscale was adjusted from 12 factors to 10 factors, and the resilience subscale maintained a 4-factor structure.

Second test: The second test questionnaire has a total of 357 items. The scoring method is the same as the initial test. The project analysis and confirmatory factor analysis were carried out on the second test data to test and optimize the factor structure model formed after the initial test. Items with low discrimination and cross-loadings were further removed from the adaptation, distress, and resilience subscales. Following these adjustments, the adaptation subscale was optimized from 5 factors to 6 factors, the distress subscale was adjusted from 10 factors and its dimensionality was refined, and the resilience subscale continued to be optimized.

Third test: It was aimed to form and validate the final formal questionnaire on mental health among college students. Based on the results of the previous two tests, the questionnaire was reviewed again, the rationality and balance of each subscale dimension were deeply considered, and optimization and adjustment were made, and finally a formal scale containing 134 items was formed. The scale was divided into three subscales: adaptation, distress, and resilience, and is rated on a scale of 1–5. According to gen-

der and grade, they were randomly divided into exploratory factor analysis group (339 students) and confirmatory factor analysis group (336 students).

3. Results

3.1. Results and Analysis of Adaptation Subscales

This study defines adaptation as the ability of individuals to maintain a dynamic balance with the environment in interpersonal relationships, learning, career choice, emotion, and self-domain [5]. Keeping this in view, a seven-dimensional framework based on the classical College Student School Adaptation Scale (CCSAS) was formulated.

3.1.1. Discrimination and Discriminatory Power Analysis

In this study, item-total score correlation coefficient was used to measure the degree of discrimination, and the discrimination power was measured by the high and low group discrimination index.

In the preliminary test, the total score of the item-total correlation coefficient is in the range of 0.18–0.67, and the MD value is between 0.392 and 1.794. According to the standard of discrimination less than 0.3 and MD value less than 0.8, a total of 5 items were eliminated due to two shortcomings in some questions at the same time. In the second test, five items with a discrimination of less than 0.3 were excluded, and nine items with an MD of less than 0.8 were excluded. The corresponding questions with insufficient discrimination were deleted, and a total of 10 items were removed, which enhanced the relevance of the questions and made the assessment more focused on the core content, and improved the quality of the assessment. In the third test, all items had an MD value greater than 0.8, which was at a high level, and no items were excluded. This indicates that after the optimization of the first two tests, the scale's dimensional structure is stable and its overall quality is high.

3.1.2. Reliability Analysis

In this study, the Cronbach's α coefficient of consistency was used to test the reliability index of the scale.

For the preliminary measurement, the Cronbach's α coefficient of the adaptation subscale was 0.897, and the internal consistency coefficients of the five factors were 0.853, 0.796, 0.810, 0.675 and 0.795, respectively, showing high internal consistency reliability as a whole.

In the second test, the Cronbach's α coefficient of the adaptation subscale was 0.890, and the internal consistency coefficients of the six factors were 0.826, 0.651, 0.778, 0.472, 0.762, and 0.827, respectively, and the reliability remained at a good level.

For the third test, Cronbach's α coefficient for the adapting subscales is 0.864. The specific results are shown in **Table 1**. The reliability of the career adaptation dimension is low ($\alpha = 0.485$), which may be related to the fact that there are only 3 questions in this dimension. From the perspective of reliability principle, when the number of questions is small, the degree of correlation between questions may be unstable, and it is difficult to fully cover the content area of this dimension, resulting in increased measurement errors and thus reducing reliability [6]. The reliability of the remaining dimensions (interpersonal, learning, self, emotion, satisfaction) is within the acceptable range ($\alpha > 0.65$), and the relatively reasonable reliability level of these dimensions provides a guarantee for the stability of the scale.

Table 1. Reliability Analysis of Adaptation Subscales and Sub-Dimensions.

Adaptation Subscale	Interpersonal	Study	Self	Career Adaptation	Mood	Satisfaction
0.864	0.658	0.697	0.771	0.485	0.782	0.652

3.1.3. Structural Validity Analysis

During preliminary assessment, all questions were limited to 7 factors, and exploratory analysis was conducted. It was found that the learning adaptation dimension still overlapped with the interpersonal relationship and campus life dimensions. For example, the question "I often ask people who have already started working about their work situation" should mainly belong to the learning adaptation dimension, but it also has high loadings on the interpersonal relationship dimension and the campus life dimension, resulting in unclear boundaries between the dimensions. Therefore, all questions were limited to 5 factors for analysis. After

continuously deleting items with low loadings and cross-loadings, and balancing the number of questions, the KMO value was 0.891, the cumulative variance explained rate reached 52.878%, and the loading values of each item on the corresponding factor ranged from 0.426 to 0.779.

In the second test, all questions were limited to 7 factors, and exploratory analysis was conducted, which showed that the self-adaptation dimension and interpersonal relationships still intersected. Therefore, all items were further analyzed within the six-factor framework. After removing items with low or cross-loadings and balancing the number of items, the KMO value was 0.765, with a cumulative variance explained of 51.49%. The loadings of each item on the corresponding factor ranged from 0.458 to 0.789.

In the third assessment, all questions were limited to 6 factors, exploratory analysis was carried out, and items with low or cross-load were continuously deleted. After balancing the number of items, the KMO value was 0.869, the cumulative variance explained rate reached 53.77%, and the loading values of each item on the corresponding factor ranged from 0.458 to 0.789.

Confirmatory factor analysis further confirmed the structural validity, and the fitting results are shown in **Table 2**.

Table 2. Overall Fit Index of the Confirmatory Factor Analysis Model of the Adaptation Subscale.

	$\chi 2$/df	GFI	IFI	NNFI	CFI	RMSEA
Adapt to the model	1.483	0.92	0.97	0.97	0.97	0.038

According to the criteria for good model fitting, the values of GFI, IFI, NNFI and CFI should generally be greater than 0.900, and the values of RMSEA should be less than 0.080. The results show that all indicators are up to excellent standards[7]. The estimation results of factor loading showed that the standardized factor load values of each item in the adaptation subscale ranged from 0.38 to 0.72, which indicated that the items in the questionnaire were well correlated with each adaptation dimension, indicating that the adaptation subscale had good structural validity.

The correlation analysis between the various dimensions was carried out on the adaptation subscale, and the results are shown in **Table 3**. The total score of the adaptation scale was significantly and positively correlated with each dimension ($p < 0.01$). There are different degrees of significant correlation between each dimension, which reflects that each dimension is both interrelated and independent, which provides a reference for the structural validity of the scale.

Table 3. Correlation Analysis Between the Dimensions of the Adaptation Subscale.

	Adaptation Scale	Interpersonal Adaptation	Learn to Adapt	Self-Adaptation	Choose a Career to Adapt	Emotional Adaptation	Satisfaction
Adaptation scale	1						
Interpersonal adaptation	0.698**	1					
Learn to adapt	0.730**	0.399**	1				
Self-adaptation	0.737**	0.563**	0.505**	1			
Choose a career to adapt	0.556**	0.233**	0.375**	0.215**	1		
Emotional adaptation	0.622**	0.367**	0.278**	0.361**	0.169**	1	
satisfaction	0.689**	0.348**	0.426**	0.394**	0.230**	0.281**	1

**: $p < 0.01$.

3.2. Results and Analysis of Distress Subscales

The operational definition of distress in college students is a multidimensional psychosomatic symptom cluster triggered by stress, encompassing cognition (e.g., obsession, paranoia), emotion (e.g., depression, anxiety), behavior (e.g., aggression, withdrawal), and somatization[8]. Based on the six core dimensions of the SCL-90, six high-incidence dimensions, such as internet addiction and sexual psychology, were added to create a preliminary 12-dimensional theoretical framework.

3.2.1. Discrimination and Discriminatory Power Analysis

This study used the item-total correlation coefficient score to measure discrimination and the high-low group discrimination index to measure discrimination.

During preliminary assessments, the correlation coeffi-

cient of the total item-dimension score of the distress subscale ranged from 0.135 to 0.770, and the MD value ranged from 0.34 to 2.24. According to the standard of discrimination less than 0.3 and MD value less than 0.8, a total of 8 items were eliminated due to two shortcomings in some questions at the same time. In the second assessment, 10 items with a discrimination of less than 0.3 were excluded, and 18 items with an MD of less than 0.8 were excluded. Delete the corresponding questions with insufficient distinction and discrimination, and remove a total of 27 items. In the third assessment, 2 items with MD values below 0.8 were excluded. In general, the structure of each dimension of the distress subscale is stable, and the overall quality is high.

3.2.2. Reliability Analysis

In this study, the Cronbach's α coefficient of consistency was used to test the reliability index of the scale.

The Cronbach's α coefficient of the troubled subscale was 0.952, indicating that the overall internal consistency reliability of the scale was extremely high for the preliminary measurement. The internal consistency coefficients of the 10 factors were 0.855, 0.834, 0.837, 0.816, 0.795, 0.788, 0.641, 0.725, 0.610, and 0.693, respectively, but the internal consistency coefficients of the aggression (0.610), dependence (0.641) and paranoia (0.693) dimensions were relatively low.

For the second test, the Cronbach's α coefficient for the distressed subscale was 0.928, and the overall internal consistency was still high. However, the internal consistency coefficients of the 10 factors were 0.499, 0.829, 0.608, 0.624, 0.710, 0.819, 0.639, 0.820, 0.781, and 0.831, respectively, and the internal consistency of impulsivity (0.624), compulsion (0.608), and dependence (0.639) dimensions was relatively low, especially the depression dimension was only 0.499, which was not very consistent.

During the third assessment, the Cronbach's α coefficient of the adapted subscale was 0.898, and the overall internal consistency was good, indicating that the homogeneity between the items of the scale was high and the measurement results were more reliable. The specific results are shown in **Table 4**; most of the dimensions have good internal consistency and can stably measure psychological distress traits, but the coefficient of the obsessive dimension is only 0.521, the correlation of questions is weak, and the fit with the core concept is not good, so it needs to be optimized.

Table 4. Internal Consistency Analysis of Each Dimension of the Troubled Subscale.

Distress Total Scale	Depression	Anxiety	Somatization	Forced	Attack	Flinch	Addiction
0.898	0.808	0.757	0.704	0.521	0.701	0.742	0.712

3.2.3. Structural Validity Analysis

During preliminary assessment, all questions were limited to 12 factors, and exploratory analysis was conducted. After deleting the items with a load of less than 0.4 and cross-load, it was finally found that 10 factors were the most suitable, and after balancing the number of questions, the KMO value was 0.943, the cumulative variance explanation rate reached 62.586%, and the load value of each item on the corresponding factors was between 0.401 and 0.841.

In the second test, all questions were limited to 12 factors, and exploratory analysis was conducted to find that anxiety and depression intersect, psychosis and somatization, and paranoia intersect with aggression/hostility. Dimensions such as withdrawal, Internet addiction, psychosexuality, impulsivity, aggression, and somatization are better. After deleting the questions with a load of less than 0.4 and cross-load, it was finally found that 10 factors were the most suitable, and after balancing the number of questions, the KMO value was 0.810, the cumulative variance explanation rate reached 60.947%, and the load value of each item on the corresponding factors was between 0.418 and 0.794.

In the third test, according to the analysis of the distribution of options, it is found that the distribution trend of all questions and the options in the dimension is relatively consistent. Only Q019 (I am very taboo to talk about sex-related topics with others) and Q057 (I think "sex" is a difficult topic) The proportion of people who choose to match (the sum of basic and complete matches) has reached more than 15%, indicating that college students still cannot accept such a direct discussion of sex, so this dimension is deleted. In the end, the two dimensions of psychopathy and psychosexuality were deleted according to the distribution of options. After three test items were optimized by exploratory factor analysis, the items with low load and cross-load were contin-

uously deleted, and the number of questions was balanced. The KMO value was 0.902, the cumulative variance explanation rate reached 60.941%, and the load value of each item on the corresponding factors was between 0.558 and 0.819.

The results of exploratory factor analysis showed that only two questions could be retained in the obsessive dimension. Therefore, the two questions were included in the model for confirmatory factor analysis, and the confirmatory results of the following three models were compared. In Model 1, Q011 and Q087 were retained; in Model 2, Q011 was deleted; and in Model 3, Q087 was deleted. The fitting results are shown in **Table 5**.

Table 5. Overall Fitting Index of the Confirmatory Factor Analysis Model of the Troubled Subscale.

	$\chi 2$/df	GFI	IFI	NNFI	CFI	RMSEA
Model 1	1.516	0.91	0.99	0.98	0.99	0.039
Model 2	1.525	0.91	0.99	0.98	0.99	0.039
Model 3	1.59	0.91	0.98	0.98	0.98	0.042

After comparing the three models and considering the balance of the number of items across the dimensions and the diversity of item presentation, Q011 and Q087 were ultimately retained. All indicators were within the acceptable range for a good-fit model. Therefore, overall, the data fit the defined model well, and the assumptions of the seven-factor model were accepted. Factor loading estimates showed that the standardized factor loadings for each item in the distress subscale ranged from 0.36 to 0.74, indicating a good correlation between each item and the corresponding dimension, indicating that the distress subscale has good structural validity.

The correlation analysis between the various dimensions was performed on the adaptation subscale, and the results are shown in **Table 6**. The total score of the adaptation scale was significant and positively correlated with each dimension ($P < 0.01$). There are different degrees of significant correlation between each dimension, which reflects that each dimension is both interrelated and independent, which provides a reference for the structural validity of the scale.

Table 6. Correlation Analysis Between the Dimensions of the Distress Subscale.

	Distress Subscale	Depression	Anxiety	Somatization	Forced	Attack	Flinch
Distress subscale	1						
depression	0.755**	1					
anxiety	0.712**	0.413**	1				
Somatization	0.725**	0.538**	0.417**	1			
forced	0.725**	0.482**	0.527**	0.420**	1		
attack	0.620**	0.386**	0.270**	0.423**	0.298**	1	
flinch	0.710**	0.521**	0.509**	0.377**	0.429**	0.321**	1
Internet addiction	0.683**	0.472**	0.364**	0.345**	0.463**	0.337**	0.354**

**: $p < 0.01$.

3.3. Results and Analysis of the Resilience Subscale

In this study, resilience is defined as the stress resistance mechanism formed by individuals through trait-environment interactions, which is manifested in the ability to maintain self-control and develop adaptive coping in the face of setbacks[9]. Based on the characteristics of college students, this study divides resilience into four dimensions: self-confidence (self-affirmation and acceptance), positive cognition (tendency to recognize things from a positive perspective), problem solving (taking the initiative to adopt effective strategies to solve problems), and social support (support obtained from social relationships).

3.3.1. Discriminative Analysis

In this study, the discriminative power was measured by the high and low group discrimination index.

In the preliminary assessment, the discriminative analysis results of the resilience subscale showed that the MD value was between 0.22 and 1.80, and the three items were excluded because the MD value was lower than 0.8 and

the discriminative power was low. During the second test, twelve items with an MD below 0.8 were excluded. In the third assessment, all items had an MD value greater than 0.8, which was at a high level, and no items were excluded. The results showed that after the optimization of the first two tests, the structure of each dimension of the scale was stable, and the items in the resilience subscale had good discriminative power, which could effectively distinguish the performance of subjects at different levels in this dimension.

3.3.2. Reliability Analysis

In this study, the Cronbach's α coefficient of consistency was used to test the reliability index of the scale.

For the preliminary assessment, the Cronbach's α coefficient of the resilience subscale was 0.890, and the internal consistency coefficients of the four factors were 0.782, 0.687, 0.789, and 0.784, respectively.

In the second test, the Cronbach's α coefficient of the resilience subscale was 0.850, and the internal consistency coefficients of the four factors were 0.719, 0.690, 0.678 and 0.782, respectively.

After the third test, the Cronbach's α coefficient of adaptation subscale was 0.833, indicating that the subscale had good internal consistency. The specific results are shown in **Table 7**, which shows that after three optimizations, the resilience subscale Cronbach's α coefficient gradually decreases, and the internal consistency of each sub-dimension also fluctuates. It may be that the reliability does not rise but decreases due to the lack of homogeneity in the adjustment of the questions, and the subsequent optimization and adjustment strategy needs to be optimized to increase the reliability.

Table 7. Internal Consistency Analysis of Each Dimension of the Resilience Subscale.

Resilience Total Scale	Assertive	Positive Perception	Problem Solving	Social Support
0.833	0.643	0.697	0.656	0.738

3.3.3. Structural Validity Analysis

During the preliminary assessment, all questions were limited to 4 factors, and exploratory analysis was conducted, and it was found that the dimensions of self-confidence and positive cognition intersected, such as "I can always find several different ways to solve problems". After continuously deleting the items with low load and cross-load, and balancing the number of questions, the KMO value was 0.891, the cumulative variance interpretation rate reached 52.878%, and the load value of each item on the corresponding factor was between 0.419 and 0.749.

In the second test, all questions were limited to 4 factors and exploratory analysis was conducted. After continuously deleting the items with low load and cross-load, and balancing the number of questions, the KMO value was 0.822, the cumulative variance interpretation rate reached 57.443%, and the load value of each item on the corresponding factor was between 0.435 and 0.785.

In the third assessment, after three test items were optimized by exploratory factor analysis, the items with low load and cross-load were continuously deleted, and the number of questions was balanced. The KMO value was 0.860, the cumulative variance explanation rate reached 51.729%, and the load value of each item on the corresponding factors was between 0.496 and 0.817.

After confirmatory factor analysis, the fitting results are shown in **Table 8**.

Table 8. Overall Fit Index of the Confirmatory Factor Analysis Model of the Resilience Subscale.

	$\chi 2$/df	GFI	IFI	NNFI	CFI	RMSEA
Resilience model	1.906	0.93	0.96	0.95	0.96	0.052

As shown in **Table 8**, all indicators are within an acceptable range for a good fit model. Therefore, overall, the data fit the defined model well, supporting the assumptions of the four-factor model. Factor loading estimates show that the standardized factor loading values for each item in the resilience subscale range from 0.30 to 0.75, indicating a certain degree of correlation between each item in the subscale and the corresponding dimension, reflecting, to

some extent, the good structural validity of the resilience subscale.

The correlation analysis between the resilience subscales (**Table 9**) showed that the total score of the scale was significantly positively correlated with each dimension ($P < 0.01$), indicating that the overall scale was consistent with the measurement objectives of each dimension, and the correlation coefficient between each dimension was between 0.255–0.498 ($P < 0.01$), which not only reflected the correlation between the dimensions, but also showed a certain degree of independence. Support the rationality of the structural validity of the scale.

Table 9. Correlation Analysis Between the Dimensions of the Resilience Subscale.

	Restore The Score	Assertive	Positive Perception	Problem Solving	Social Support
Restore the score	1				
assertive	0.689**	1			
Positive perception	0.792**	0.375**	1		
Problem solving	0.725**	0.255**	0.498**	1	
Social support	0.722**	0.261**	0.492**	0.422**	1

**: $p < 0.01$.

4. Discussion

4.1. Adaptation Subscale

Based on theoretical assumptions, this study categorized college students' adaptation into the dimensions of interpersonal relationships, campus life, academics, career choices, emotions, self-adaptation, and satisfaction. Initial data analysis revealed significant cross-loadings between the campus life adaptation dimension and academic adaptation, with freshmen scoring significantly higher on this dimension than those from other grades, indicating grade-specific content. Consequently, this dimension was removed. Reliability and validity testing of the resulting adaptation subscale revealed an internal consistency reliability of 0.864 for the total scale, with reliability coefficients ranging from 0.658 to 0.782 for the interpersonal relationships, academics, self, emotions, and satisfaction dimensions, and a reliability coefficient of 0.485 for the career choice dimension, likely due to the small number of items and the significant differences in career pressure experienced by students across grades. Confirmatory factor analysis demonstrated a good fit, with the six-dimensional model effectively distinguishing core adaptation domains such as interpersonal relationships and academics. This scale confirms its ability to effectively reflect theoretical dimensions of college students' adaptation and provides a reliable tool for measuring their adaptation.

4.2. Distress Subscale

Based on the research on the mental health of college students, this study draws on the core dimensions of the SCL-90 scale and combines the characteristics of college students, and preliminarily constructs a mental health measurement tool containing 12 dimensions. After three screenings, due to the low detection rate of five dimensions such as psychopathy and psychosexuality, the seven dimensions of high detection rate of depression, anxiety, somatization, withdrawal, aggression, compulsion, and Internet addiction were finally retained, which was consistent with the conclusions of previous studies[10,11]. The reliability and validity test of the distress subscale formed by the study showed that the internal consistency reliability coefficient of the total scale was 0.898, and the reliability coefficient of depression, anxiety and other dimensions was between 0.701 and 0.808, and only the obsessive-compulsive dimension covered different levels such as compulsive behavior and thinking due to the questions, and the internal consistency coefficient was 0.521. The confirmatory factor analysis has excellent fit and good structural validity, which confirms that the scale can effectively measure the psychological distress of college students, and its theoretical concept is acceptable.

4.3. Resilience Subscale

This study defines college students' resilience as the ability and resources to recover quickly from stress. Based

on theoretical construction, it is divided into four factors: self-confidence, positive cognition, problem-solving, and social support. Three tests were administered to develop a resilience subscale. Reliability and validity tests revealed an internal consistency coefficient of 0.833 for the total scale, with individual subscales ranging from 0.643 to 0.738, both within acceptable ranges. Confirmatory factor analysis demonstrated good construct validity, confirming that the scale effectively reflects the theoretical dimensions of college students' resilience and supports its theoretical conception.

5. Conclusions

This study assessed college students' mental health across three dimensions: adaptation, distress, and resilience. The internal consistency reliability of the three subscales of adaptation, distress and resilience was 0.864, 0.898 and 0.833, respectively. The results of confirmatory factor analysis showed that the structural validity of the three subscales of adaptation, distress and resilience was good. This provides a scientific tool for college students' mental health assessment. However, the career choice and compulsion dimensions exhibited relatively lower reliability in the study, so future research should optimize sampling methods and item design to further enhance the measurement accuracy of the tool.

Author Contributions

Conceptualization, S.L.; methodology, J.L., J.W. and M.T.; validation, J.L., M.T. and S.L.; formal analysis, J.L. and M.T.; investigation, J.L., J.W. and M.T.; data curation, J.L., J.W. and M.T.; writing—original draft preparation, J.L. and S.L.; writing—review and editing, S.L.; supervision, S.L. and J.W. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

Ethical review and approval were waived for this study due to the exclusive use of anonymized, non-identifiable human data, no intervention or interaction with participants, no collection of sensitive personal information or involvement of commercial interests, and no foreseeable risk of physical or psychological harm.

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

For access to the data of this study, please contact the corresponding author with a reasonable request.

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Conflicts of Interest

The authors declare no conflict of interest.

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